TB-016: PLATE HEAT EXCHANGER SERVICING

PURPOSE

To educate customers on the procedure and practices for disassembly, service, and reassembly of standard Dry Coolers plate heat exchangers.

REASONS FOR SERVICE

During normal operation of a Dry Coolers system there may be cause to service the plate heat exchanger. These reasons may include;

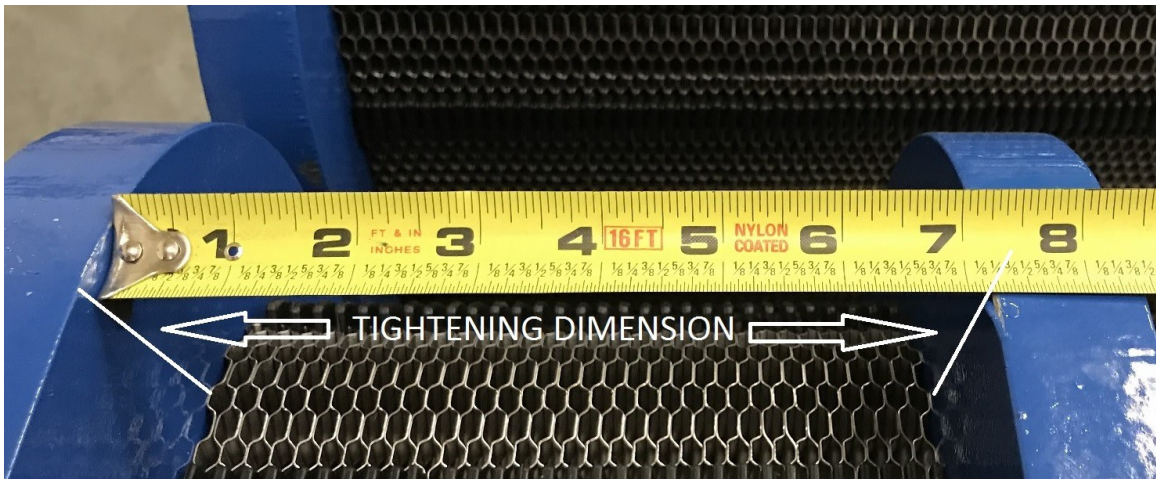
- Fouling from sediment, debris, scaling, etc.
- Adding plates to lower pressure drop or accommodate increased capacity
- Deteriorated gaskets from fatigue or chemical attack
- Inspection during a system health analysis

Regardless of the reason for service, there are several important items to consider when servicing a plate heat exchanger.

Safety Note: The thin sheet metal of the plates have sharp edges that can cut bare skin when handling. Take caution when working with heat exchanger plates and use appropriate safety gear, such as leather gloves.

DISASSEMBLY

Before you begin to disassemble the heat exchanger, measure the compressed plate pack inside the frame. This is referred to as the tightening dimension, or 'A' dimension of the heat exchanger. Be as precise as possible, measure at several points to ensure the heat exchanger was assembled evenly, and write this number down for later reference. If more plates are being added to the heat exchanger obtain a new tightening dimension by using the ratio of plates to the tightening dimension - (#New Plates / #Old Plates) * Old Tightening Dimension = New Dim.



Measuring the 'A' or Tightening Dimension

Warning- Contents Under Pressure: Liquid trapped in the heat exchanger will begin leaking out as soon as any seals are released. Isolate the heat exchanger as best as possible from the connecting piping and vent ***both*** *sides of the heat exchanger before proceeding.*

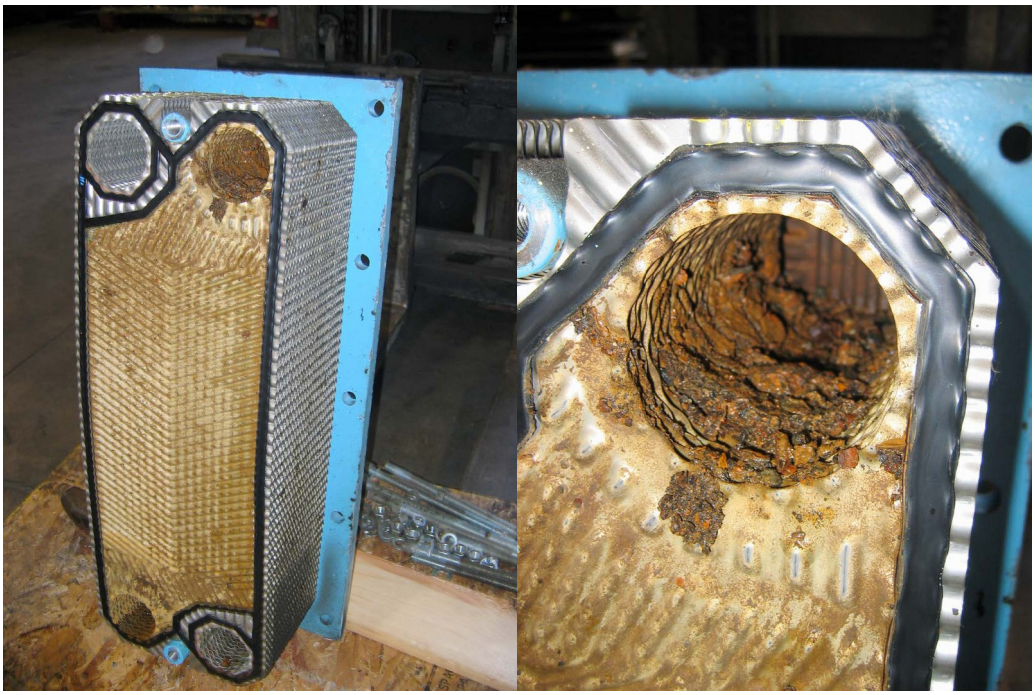
Once the tightening dimension is recorded begin loosening the main nuts holding the frame together. Taking care not to allow plates to fall free, back the nuts off until the frame follower (rear frame piece compressing the plates) can slide far enough back to remove the plates.

CLEANING AND INSPECTION

Once the plate pack is removed from the heat exchanger frame begin inspecting the individual plates.

Gaskets should be free of scaling on the mating surfaces and the rubber should be pliant. Since gaskets are compressed to less than half of the original size just a few yeas of service can force a 'set' and the rubber will become too firm to easily seat and seal. No cracks or breaks should be present in the entire gasket. If any gaskets show signs of wear or no longer expand when released they will need to be

replaced. It is not recommended to mix old and new gaskets when servicing a heat exchanger to avoid sealing issues associated with reusing old gaskets.



Fouled Plates and Clogged Outlet (Untreated Mill Water) – Glued In Gaskets

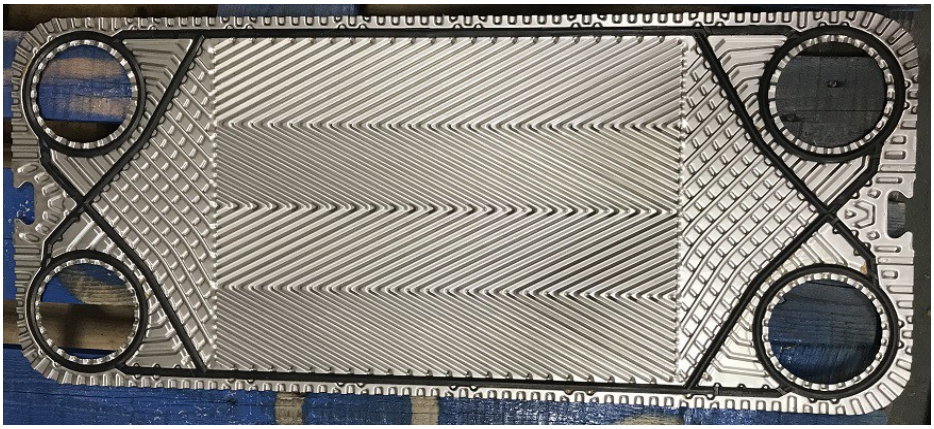
The plates should be free of corrosion, scaling, dirt, sediment, debris, or anything else that would block passages or coat the surface of the plate. With the gasket removed a mild cleanser and soft brush can be used to clean the plates. Elevate the level of aggressiveness in the cleanser and scrubbing as needed to clean the plates, taking care to ensure any chemicals used are safe for the plate material and any tools/methods used do not scratch or damage the plates. Typical plates are 300-series stainless steel, either 304 or 316. A screwdriver or similar tool may be required to remove glued gaskets. MEK and Acetone are acceptable solvents to use on a bare plate (gasket removed). Follow all safety protocols for the chemicals and tools used. Remove *all* of the glue when discarding glued-on gaskets.

PREPARING THE PLATE PACK

After the plates have been refurbished, or new plates are received, the plates must be assembled into the 'plate pack' carefully to ensure the thermal profile is correctly

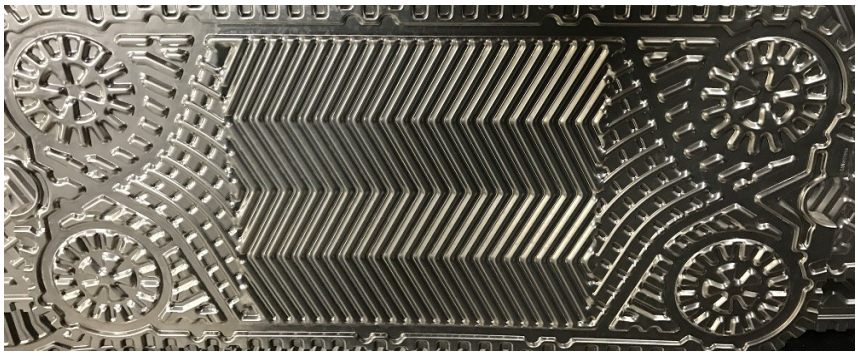
aligned and the gaskets will properly seal. Assemble the plate pack in the following steps.

First, prepare the starting plate. This is a standard plate which is placed against the frame and is the first and last plate for both fluid paths. The gasket is made by splitting two standard gaskets and gluing the halves to the plate to form a zero-pass plate, removing the heat exchanger frame from the thermal envelope. See Dry Coolers' Technical Bulletin TB-017 Heat Exchanger Starter Gasket, if needed.



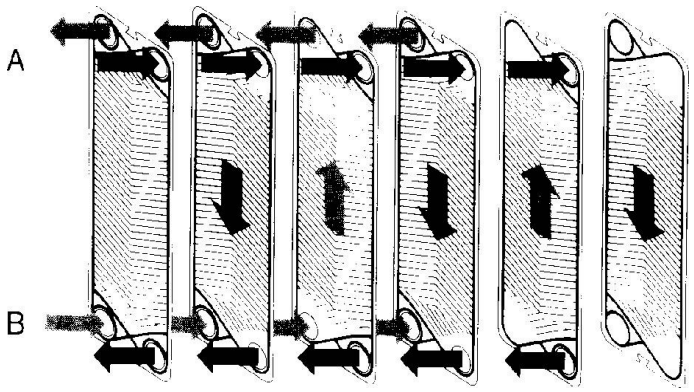
Starter Plate

Prepare the back plate. This is the final plate in the pack and does not have any through-holes in it. A standard gasket is attached to the plate and starts the alternating pattern that will continue through the pack.



Back Plate

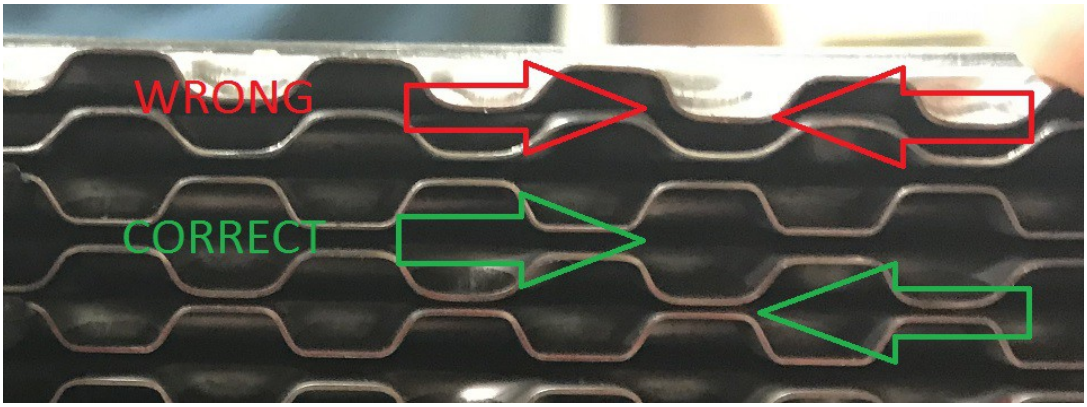
Assemble the plate pack. Ensure the gaskets alternate left to right for each plate to allow a pass of each fluid on every-other-plate. Any differences in the pattern of the plates can be ignored when arranging them.



Alternating Gaskets While Assembling a Plate Pack

INSPECT THE PLATE PACK

Once the plate pack is assembled carefully inspect the orientation of the plates. Pull the plates together by hand against a table or work bench and examine the edge of the pack. Ensure each plate is staggered compared to the plates immediately before and after, such that a "honey comb" pattern is formed.



Top Most Plate Out Of Sequence

Carefully inspect every gasket to ensure the rubber is fully seated against the groove in the plate, the locking or hanging tabs are fully engaged in the edge of the plate, and no gaps or spaces are present between any two plates.

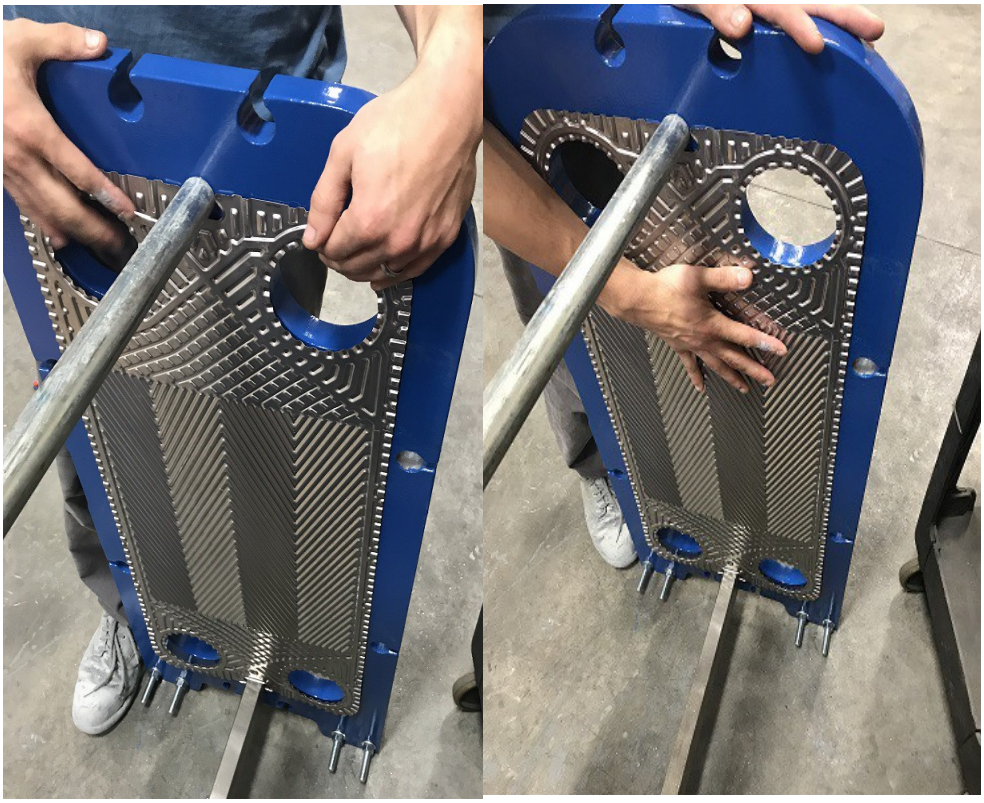
Look through the header ports of the plate pack and inspect the alignment of the plates. Press down with firm pressure against a table or bench to lightly compress

the pack and check for even spacing between the plates, a consistent pattern in the plate pack, and proper positioning of the back plate.

Looking Through a Header Port

ASSEMBLING THE HEAT EXCHANGER

Once the plate pack is assembled and it has been verified that the plates and gaskets are arranged properly it must be loaded into the frame. This is the most difficult portion of the process, as transferring the plates leaves room for mistakes and slipping or dropping plates can easily lead to unseating or tearing gaskets. Using clamping or other means to hold the plates together or in place on the frame can damage plates and gaskets, get in the way during final assembly, and has potential to cause damage or upset the process when removed.



Placing the Starter Plate in the Frame

Begin the assembly process by placing the starter plate in the frame. Using the frame rails and inlet/outlet ports as guides, ensure the starter plate is properly aligned in the frame with the gasket flat on the frame. If the plate is bowed and not making complete contact ensure that it can easily be flattened by placing your hand on the center of the plate and applying light pressure. Check that the frame rails are not binding or constricting the plate.

After the starter plate is loaded begin placing individual plates* into the frame. Ensure the gasket is firmly against the previously installed plate, the plate is not binding in the frame, and the plate orientation is maintaining the "honey comb" pattern.

**Note: Individual plates are inserted into the frame to avoid binding on the frame rails or slipping and causing damage to the plates/gaskets or injury to the operator.*

Once the back plate has been installed perform another inspection of the plate pack, again checking for plate orientation creating the "honey comb" pattern, gaskets being fully seated, no gaps present, and no plates out of alignment.

With the plates correctly installed into the frame, bring the follower (rear frame section) of the frame in contact with the back plate of the plate pack. Apply a **light** amount of pressure with the frame bolts. Perform the plate inspection again*.

**Note: Proper orientation of the plates and fully seated gaskets are critical to ensuring the heat exchanger can transfer temperature and not leak. Multiple checks are recommended to ensure no mistakes are overlooked.*

After inspecting the plate pack, begin tightening the frame bolts to compress the plates together. An impact wrench or other power/air tool is recommended. Use an alternating tightening pattern, or "star" pattern, when tightening the frame to ensure even pressure on the plates.

Continue tightening the frame/follower until the tightening dimension is reached. Measure the frame in several locations to ensure the heat exchanger is evenly tightened. **DO NOT TIGHTEN FURTHER THAN THE TIGHTENING DIMENSION TO AVOID DAMAGE TO THE PLATES AND GASKETS.** Perform another inspection of the plates to ensure the orientation is correct and no plates or gaskets shifted during tightening.

Special Case: Adding plates to an existing heat exchanger. When adding plates to a heat exchanger do not intermix the plates. Instead, remove the back plate, leave the main plate pack intact, and add the new plates to the back of the existing plate pack. Do not decompress the existing plate pack to help ensure the seals remain intact.

RELATED BULLETINS:

- TB-017 Heat Exchanger Starter Gasket

REVISION LEVEL:

- Rev 0: Original, rdp 10/19/2017